Kobayashi et al.

* NOTICES *

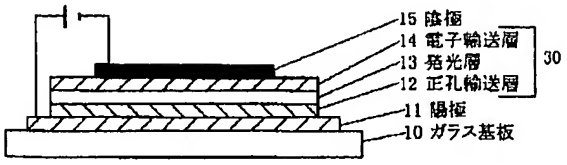
H05B 33/04

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

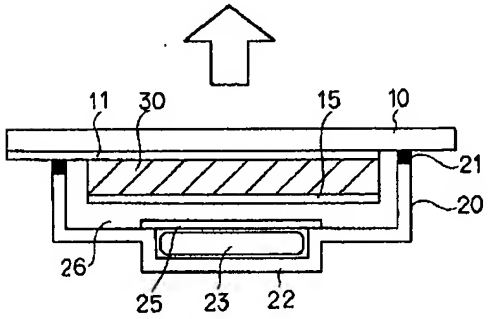
[Drawing 7]

図 7



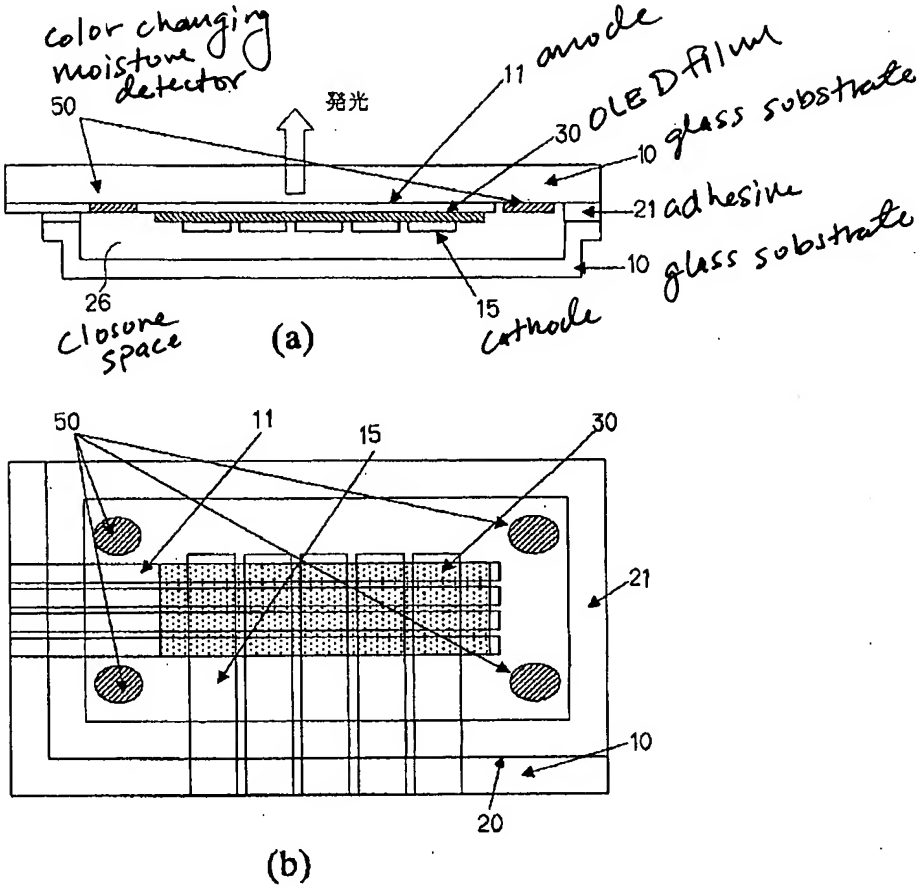
[Drawing 8]

図 8



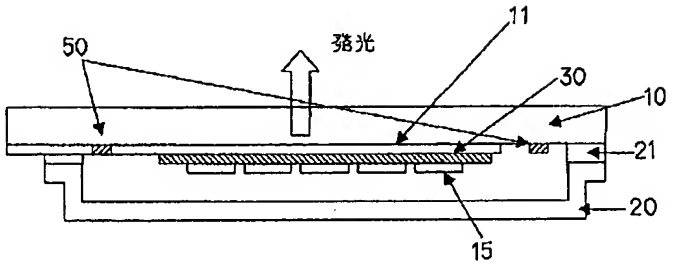
[Drawing 1]

図 1

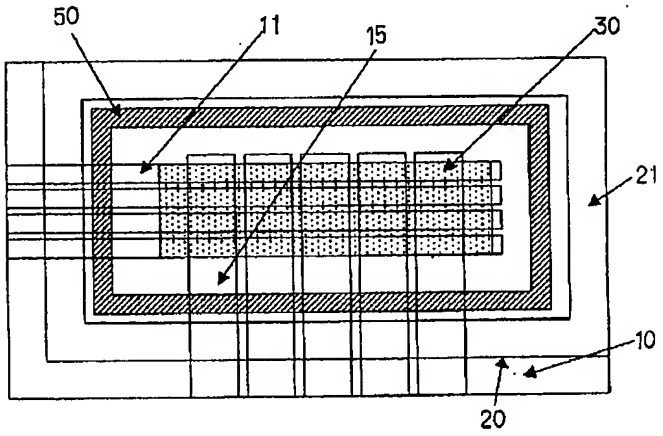

color changing moisture detector
50
発光
11 anode
30 OLED film
10 glass substrate
21 adhesive
10 glass substrate
26
closure space
(a)
15
cathode
50
11
15
30
21
10
20
(b)

[Drawing 2]

図 2



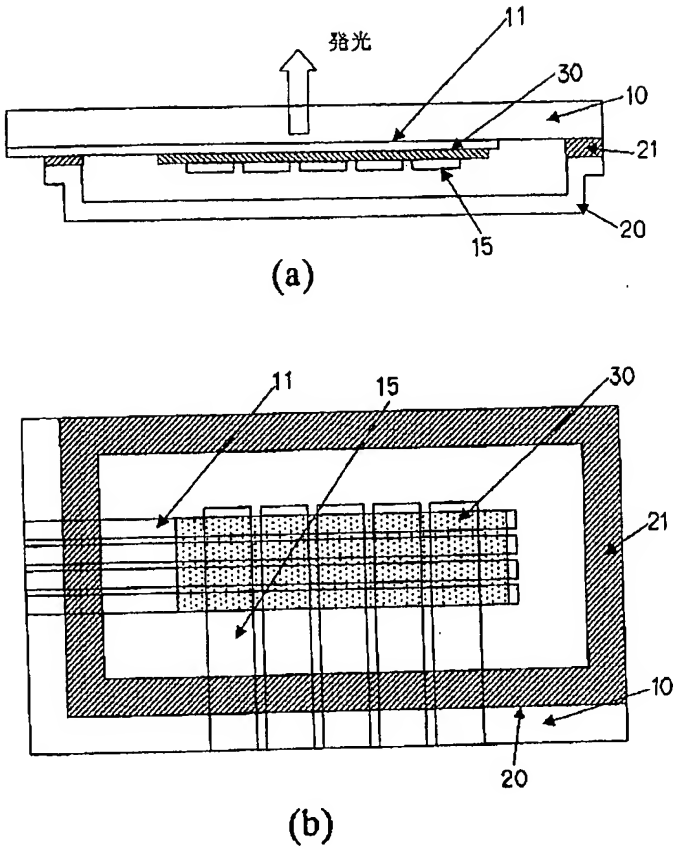
(a)



(b)

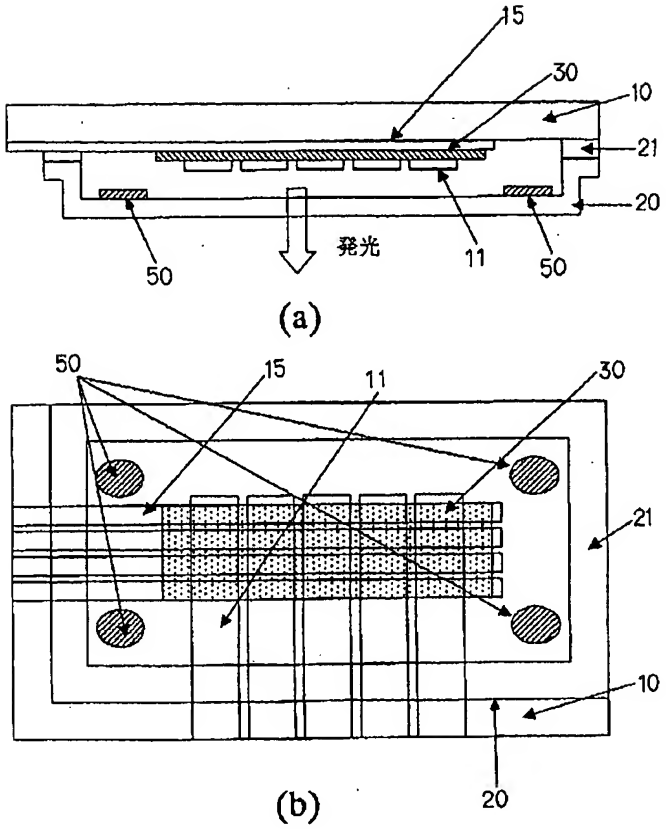
[Drawing 3]

図 3



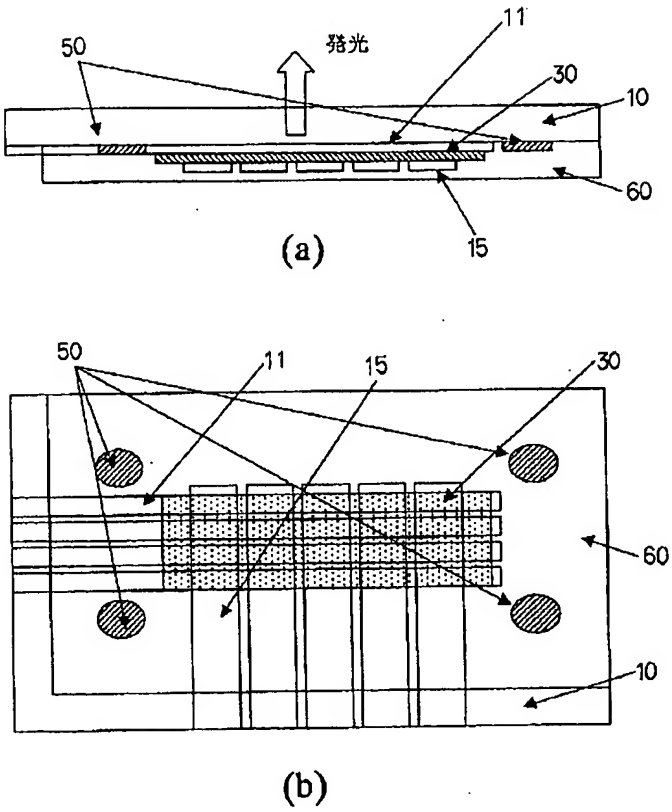
[Drawing 4]

図 4



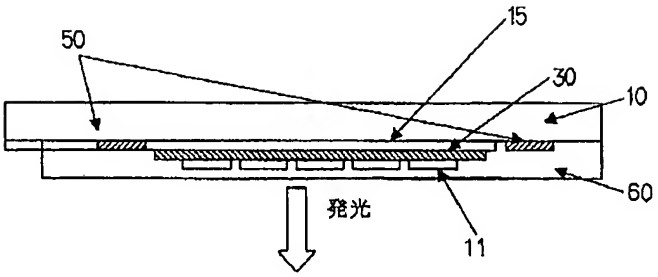
[Drawing 5]

図 5

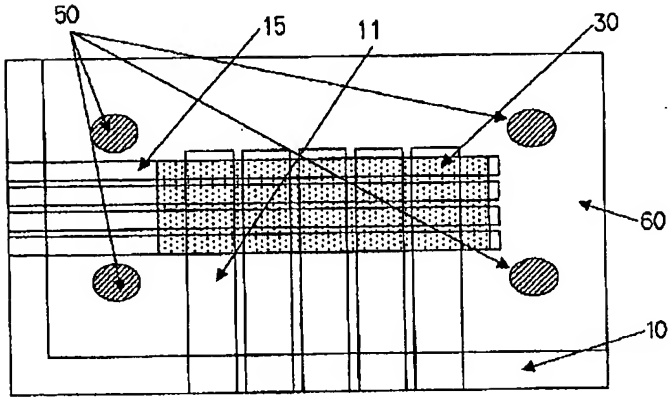


[Drawing 6]

図 6



(a)



(b)

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] With respect to a display, especially this invention is applied to the electroluminescence display using an organic electroluminescence (Electro Luminescence) component, and relates to an effective technique.
[0002]
[Description of the Prior Art] In recent years, the electroluminescence display (henceforth an OLED indicating equipment) using an organic electroluminescent element attracts attention as CRT and a next-generation flat display unit which replaces a liquid crystal display. This OLED indicating equipment is compared with the present flat display units, such as a liquid crystal display. (1) An electrical potential difference required for luminescence is as low as less than [10V], and can make power consumption small. (2) Since it is a spontaneous light type, it has the descriptions, like (3) (4) with unnecessary back light which vacuum structure like same spontaneous light type plasma display is unnecessary, and is suitable for lightweight-izing and thin shape-ization response time is as short as several microseconds, and an angle of visibility is as large as 170 degrees or more. In addition, such a technique is indicated by for example, the following reference (b).
Although (**) "acquire the basic patent of a circuit towards highly-minute-izing of an organic EL panel", the Nikkei electronics, 2000.4.24 (no.768), pp.163-170, and the OLED display mentioned above on April 24, 2000 are divided roughly into the OLED display of a passive matrix, and the OLED display of an active matrix by the configuration of an anode plate and cathode, the basic structure of an OLED display device is the same.
[0003] Drawing 7 is the sectional view showing the basic structure of an OLED display device. As shown in drawing 7 , the laminating of the anode plate 11 which consists of transparent electrodes, such as ITO (Indium Thin Oxide), on a glass substrate 10, the electron hole transportation layer 12, a luminous layer 13, the electronic transportation layer 14, and the cathode 15 is carried out in this sequence, and an OLED display device is constituted. The organic molecule which forms a luminous layer 13 is excited, an exciton arises, light is emitted from a luminous layer 13 in the process in which this exciton carries out radiation deactivation, from the transparent anode plate 11, the electron hole poured in from the anode plate 11 when the electrical potential difference was impressed between an anode plate 11 and cathode 15, and the electron poured in from cathode 15 recombine inside a luminous layer 13, and it emits [this light is emitted to the exterior through a glass substrate 10 and] light. Hereafter, the multilayers which consist of the electron hole transportation layer 12, a luminous layer 13, and the electronic transportation layer 14 are called OLED film 30. The OLED display of a passive matrix constitutes the anode plate 11 shown in drawing 7 , and cathode 15 from a stripe electrode of a large number which intersect perpendicularly mutually on both sides of the OLED film 30, impresses driver voltage to the pixel of the intersection of many stripe electrodes used as an anode plate 11, and many stripe electrodes used as cathode 15, and displays an image. Moreover, the OLED display of an active matrix forms an anode plate 11 for every pixel, impresses driver voltage through the active

element prepared in this anode plate 11 for every pixel, for example, TFT, (thin film transistor; Thin Film Transistor), and displays an image.

[0004] Drawing 8 is the important section sectional view showing the basic structure of the conventional OLED display. The OLED display shown in drawing 8 consists of a glass substrate 10 used as the screen, and a closure member 20 by which a bonded seal is carried out with adhesives 21 on this glass substrate 10. In addition, adhesives 21 consist of ultraviolet curing mold resin. An anode plate 11, the OLED film 30, and cathode 15 are formed in a glass substrate 10, and as mentioned above, the OLED film 30 is formed in it by the multilayers which consist of the electron hole transportation layer 12, a luminous layer 13, and the electronic transportation layer 14. The light which emitted light by the luminous layer 13 of the OLED film 30 is emitted to a glass substrate 10 side, as an arrow head shows to drawing 8 . Moreover, as it consists of metals, such as glass or stainless steel, and is shown in drawing 8 , a crevice 22 is formed in a part of closure member 20, in this crevice, on the tape 25, the drying agent 23 is being fixed and the closure member 20 is contained. Said crevice 22 is established in the abbreviation center section of the closure member 20. Moreover, it dries in the closure space 26 surrounded with the closure member 20 and the glass substrate 10, and the inactive gas (for example, nitrogen gas) is enclosed with it. In addition, the OLED display shown in drawing 8 is an OLED display of a passive matrix, and it is formed so that many stripe electrodes used as an anode plate 11 and many stripe electrodes used as cathode 15 may intersect perpendicularly on both sides of the OLED film 30. However, in drawing 8 , illustration of many stripe electrodes used as an anode plate 11 and many stripe electrodes used as cathode 15 is omitted.

[0005]

[Problem(s) to be Solved by the Invention] Cathode 15 is constituted from Mg/Ag, LiF/aluminum, or calcium/aluminum by the OLED display mentioned above. And it becomes the greatest cause of a defect that the OLED film 30 and cathode 15 are called so-called dark spot which resistance was low to water, oxygen, heat, or ultraviolet rays, especially water had great effect on the OLED film 30, and luminescence was checked, and became nonluminescent. For this reason, if these elements need to prevent trespassing upon the above-mentioned OLED film 30 and cathode 15 and are shown in the conventional OLED display there in order to realize a reliable OLED display, the dry inactive gas (for example, nitrogen gas of -80 degrees C or less of frost points (dew-point)) is enclosed in the closure space by which the closure is carried out by the closure member 20 at the time of manufacture of an OLED display. Although it is required to continue maintaining it even after panel-izing this condition, it is possible through adhesives 21 that the water molecule of the open air invades in closure space. Then, in order to absorb the water molecule which invaded from the exterior and to always maintain the inside of closure space at the suitable dryness at the time of the closure after being panel-ized, it is made to mount a drying agent 23 in the crevice 22 of the closure member 20.

[0006] However, if a drying agent 23 adsorbs the moisture of the specified quantity (this is determined according to the ingredient of a drying agent 23, and the amount of the drying agent 23 in which it is mounted and deals), the adsorption capacity force of moisture will decline. Therefore, after panel-izing, when the amount of the moisture (for example, moisture which invades through adhesives 21) which invades in the closure space by which the closure is carried out by the closure member 20 exceeds the specified quantity mentioned above, a duty will not be achieved, but the moisture which invades in closure space will have great effect on the OLED film 30, and the defect called above-mentioned dark spot will generate a drying agent 23. Thus, it is not an overstatement, even if the life of an OLED display is referred to as being determined according to the amount of the moisture which invaded in closure space after panel-izing. Therefore, if the amount of the moisture which invaded in closure space is detectable after panel-izing, it will be possible to predict the life of an OLED display to some extent, and this shipping the OLED display which has a life beyond predetermined time in the factory-shipments phase of for example, an OLED display, or the life of an OLED display currently used actually will become possible [getting to know how much / after / it is about].

[0007] However, if shown in the conventional OLED display, after [which was panel-ized] mentioning above, detecting the amount of the moisture which invaded in closure space is not proposed. It is made

in order that this invention may solve the trouble of said conventional technique, and in the display which used the electroluminescent element, after panel-izing the purpose of this invention, it is to offer the technique which becomes possible [detecting the amount of the moisture which invaded in closure space]. As new along [said] this invention a description as the other purposes is clarified by description and the accompanying drawing of this specification.

[0008]

[Means for Solving the Problem] It will be as follows if the outline of a typical thing is briefly explained among invention indicated in this application. The electroluminescent element by which this invention is prepared in the viewing area on a substrate and said substrate, The display which pastes up on said substrate through adhesives and is equipped with a wrap closure member for said electroluminescent element, Or a substrate and the electroluminescent element prepared in the viewing area on said substrate, Said electroluminescent element is applied to a display equipped with a wrap protective coat, and the description of having the indicator from which a color changes is carried out by adsorbing moisture to fields other than said viewing area on said substrate. With the gestalt of 1 operation of this invention, this indicator is formed so that said viewing area may be surrounded.

[0009] Moreover, with the gestalt of other operations of this invention, this indicator is formed in fields other than said viewing area on the field by the side of said electroluminescent element of said closure member. With the gestalt of other operations of this invention, on the field by the side of said electroluminescent element of said closure member, this indicator is formed so that said viewing area may be surrounded. Said indicator consists of an inorganic material (for example, calcium) or an organic material (for example, anthocyanin system coloring matter). Moreover, in this invention, the ingredient from which a color changes contains said adhesives by adsorbing moisture. The ingredient from which a color changes is an organic material (for example, anthocyanin system coloring matter) by adsorbing this moisture.

[0010] Since it was made to make the ingredient from which a color changes the indicator from which a color changes by adsorbing moisture in the indicating equipment using an electroluminescent element by adsorbing moisture to built-in or adhesives contain according to the above-mentioned means, after panel-izing, it becomes possible to detect the amount of the moisture which invaded in closure space. Thereby, it is possible to predict the life of an OLED display to some extent, for example, shipping the OLED display which has a life beyond predetermined time, or the life of an OLED display currently used actually becomes possible [getting to know how much / after / it is about] in the factory-shipments phase of an OLED display.

[0011]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained to a detail with reference to a drawing. In addition, in the complete diagram for explaining the gestalt of operation, what has the same function attaches the same sign, and explanation of the repeat is omitted.

[Gestalt 1 of operation] drawing 1 is drawing showing the outline configuration of the OLED display of the gestalt 1 of operation of this invention, and this drawing (a) is a top view showing arrangement of each part which shows an important section sectional view and this drawing (b) in this drawing (a). The OLED display of the gestalt of this operation consists of a glass substrate 10 used as the screen, and a closure member 20 by which a bonded seal is carried out with adhesives 21 on this glass substrate 10. In addition, adhesives 21 consist of ultraviolet curing mold resin or heat-curing mold resin. An anode plate 11, the OLED film 30, and cathode 15 are formed in a glass substrate 10, and as mentioned above, the OLED film 30 is formed in it by the multilayers which consist of the electron hole transportation layer 12, a luminous layer 13, and the electronic transportation layer 14. The light which emitted light by the luminous layer 13 is emitted to a glass substrate 10 side, as an arrow head shows to drawing 1 . The OLED display of the gestalt of this operation is an OLED display of a passive matrix, and it is formed so that many stripe electrodes used as an anode plate 11 and many stripe electrodes used as cathode 15 may intersect perpendicularly on both sides of the OLED film 30.

[0012] It dries in the closure space 26 which the closure member 20 consisted of metals, such as glass or stainless steel, and was surrounded with the closure member 20 and the glass substrate 10, and the

inactive gas (for example, nitrogen gas) is enclosed with it. In addition, also in the display of the gestalt of this operation, although a crevice 22 is formed in a part of closure member 20 and the drying agent 23 is fixed and contained on the tape 25 in this crevice for example, it is omitting by drawing 1 . As shown in drawing 1 , with the gestalt of this operation, the indicator 50 from which a color changes by adsorbing moisture can be formed on a glass substrate 10, and this indicator 50 is formed in a glass substrate 10 by the approach of vacuum evaporationo or spreading. In drawing 1 , although this indicator 50 is formed in four corners of the field covered by the closure member 20 of a glass substrate 10 as shown in this drawing (b), as long as it is fields other than a luminescence field (namely, field in which the OLED film 30 is formed), it may prepare in any location, and a configuration (or area) can also adopt the configuration of arbitration further. This indicator 50 consists of organic materials, such as inorganic materials, such as calcium, or anthocyanin system coloring matter.

[0013] In addition, since a glass substrate 10 side is manufactured in a vacuum or desiccation nitrogen-gas-atmosphere mind, this indicator 50 can be prevented from usually adsorbing moisture into a production process in the gestalt of this operation, although it is necessary to make it an indicator 50 not adsorb moisture into a production process. Thus, with the gestalt of this operation, since the indicator 50 from which a color changes to a glass substrate 10 by adsorbing moisture was formed, after panel-izing, the amount of the moisture which invaded in the closure space 26 is detectable. For example, calcium becomes cloudy by adsorbing moisture, and according to the condition of this nebula, after panel-izing, it can detect the amount of the moisture which invaded in the closure space 26. Moreover, anthocyanin system coloring matter changes so that a color tone may become deep by adsorbing moisture, although it has a respectively characteristic color, and after panel-izing, the amount of the moisture which invaded in the closure space 26 is detectable [with the condition of this color tone]. Therefore, with the gestalt of this operation, it becomes possible to predict the life of an OLED display to some extent. This shipping the OLED display which has a life beyond predetermined time in the factory-shipments phase of for example, an OLED display, or the life of an OLED display currently used actually becomes possible [getting to know how much / after / it is about].

[0014] Drawing 2 is drawing showing the abbreviation configuration of the modification of the OLED display of the gestalt 1 of operation of this invention, and this drawing (a) is a top view showing arrangement of each part which shows an important section sectional view and this drawing (b) in this drawing (a). Hereafter, a difference with the OLED display shown in drawing 1 is explained about the OLED display shown in drawing 2 . As shown in this drawing (b), difference of the OLED indicating equipment shown in drawing 2 is carried out to the OLED equipment which shows an indicator 50 to drawing 1 with the point formed so that a luminescence field (namely, field in which the OLED film 30 is formed) might be surrounded. This indicator 50 consists of organic materials, such as inorganic materials which were mentioned above, such as calcium, or anthocyanin system coloring matter. Usually, although it is most which invades from the outside through adhesives 21, the moisture which invades in the closure space 26 after panel-izing has a possibility that the moisture which invades from the meantime may be undetectable, when an indicator 50 is formed in the shape of an island, as shown in drawing 1 . However, with the gestalt of this operation, since an indicator 50 is formed so that a viewing area may be surrounded, moisture becomes possible [detecting, even if it invades from which direction].

[0015] [Gestalt 2 of operation] drawing 3 is drawing showing the outline configuration of the OLED display of the gestalt 2 of operation of this invention, and this drawing (a) is a top view showing arrangement of each part which shows an important section sectional view and this drawing (b) in this drawing (a). Hereafter, a difference with the OLED display of the gestalt 1 of the above-mentioned operation is explained about the OLED display of the gestalt of this operation. Difference of the OLED display of the gestalt 2 of this operation is carried out to the OLED display of the gestalt 1 of the above-mentioned operation in that the ingredient from which moisture is adsorbed and a color changes was made to contain in adhesives. As an ingredient which adhesives 21 are made to contain, organic materials, such as anthocyanin system coloring matter, are used, for example. In addition, when using anthocyanin system coloring matter, adhesives 21 are made to contain at a rate of 1.5 g/cm3. If

adhesives 21 are made to contain anthocyanin system coloring matter, it will be colored purplish red - purple by the initial state, and color change will be produced if moisture invades into adhesives 21. These color change differs with the ingredient used for adhesives 21, and if adhesives 21 are ultraviolet curing mold resin (acrylic ester system), if they is heat-curing mold resin (diamine curing agent), they will change to more skillful red at blue - green. Thus, also with the gestalt of this operation, after panel-izing, the amount of the moisture which invaded in the closure space 26 can be detected, and it becomes possible to acquire the same operation and effectiveness as the gestalt 1 of the above-mentioned operation. Furthermore, with the gestalt of this operation, separately, since it is not necessary to create an indicator 50, it becomes possible to simplify a production process.

[0016] [Gestalt 3 of operation] drawing 4 is drawing showing the outline configuration of the OLED display of the gestalt 3 of operation of this invention, and this drawing (a) is a top view showing arrangement of each part which shows an important section sectional view and this drawing (b) in this drawing (a). Hereafter, a difference with the OLED display of the gestalt 1 of the above-mentioned operation is explained about the OLED display of the gestalt of this operation. Difference of the OLED display of the gestalt 3 of this operation is carried out to the OLED display of the gestalt 1 of the above-mentioned operation at the point of following (1) and (2).

(1) The point that the light which emitted light by the luminous layer 13 of the OLED film 30 is emitted to the closure member 20 side as an arrow head shows to drawing 4 R> 4.

(2) The point that an indicator 50 is formed in the closure member 20 side.

Therefore, with the gestalt of this operation, the closure member 20 consists of transparent ingredients, further, cathode 15 is formed in the glass substrate 10 side of the OLED film 30, and the anode plate 11 is formed in the transparent closure member 20 side of the OLED film 30. Moreover, although the indicator 50 is formed in four corners of the field by the side of the OLED film 30 of the closure member 20 by drawing 4 as shown in this drawing (b) On the field by the side of the OLED film 30 of the transparent closure member 20, if it is fields other than a luminescence field (namely, field which counters the field in which the OLED film 30 is formed), you may prepare in any location and a configuration (or area) can also adopt the configuration of arbitration further.

[0017] For example, like the case where it is shown in drawing 2 , on the field by the side of the OLED film 30 of the transparent closure member 20, an indicator 50 may be formed so that a luminescence field may be surrounded. This indicator 50 consists of organic materials, such as inorganic materials, such as calcium, or anthocyanin system coloring matter, as mentioned above. In addition, although it also sets to the display of the gestalt of this operation and the drying agent 23 is fixed and contained by a part of transparent closure member 20 (this serves as fields other than a luminescence field), for example, it is omitting in drawing 1 . Moreover, it is necessary to make it an indicator 50 not adsorb moisture into a production process in the gestalt of this operation. Also in the gestalt of this operation, after panel-izing, the amount of the moisture which invaded in the closure space 26 can be detected, and it becomes possible to acquire the same operation and effectiveness as the gestalt 1 of the above-mentioned operation.

[0018] [Gestalt 4 of operation] drawing 5 is drawing showing the outline configuration of the OLED display of the gestalt 4 of operation of this invention, and this drawing (a) is a top view showing arrangement of each part which shows an important section sectional view and this drawing (b) in this drawing (a). Hereafter, a difference with the OLED display of the gestalt 1 of the above-mentioned operation is explained about the OLED display of the gestalt of this operation. Difference of the OLED display of the gestalt 3 of this operation is carried out to the OLED display of the gestalt 1 of the above-mentioned operation in that the protective coat (passivation film) 60 was formed on a glass substrate 10 and the OLED film 30 instead of pasting up the closure member 20 on a glass substrate 10 through adhesives 21. It may consist of synthetic-resin film of an epoxy system, an urethane system, acrylic, a vinyl system, and a silicone system, and this protective coat 60 may be transparent, and that of this protective coat 60 may be opaque. With the gestalt of this operation, since moisture stops easily being able to invade into the OLED film 30 from the exterior as compared with the structure of pasting up the closure member 20 on a glass substrate 10 through adhesives 21 like the gestalt of each above-

mentioned operation since the protective coat 60 is formed the whole surface on a glass substrate 10 and the OLED film 30, it becomes possible to raise moisture resistance. Moreover, as compared with the OLED display of the gestalt of each above-mentioned operation, it becomes possible to attain thin shape-ization more.

[0019] In addition, in the display of the gestalt of this operation, since the drying agent 23 shown in drawing 8 becomes unnecessary, it becomes possible to simplify a production process. With the gestalt of this operation, as an indicator 50 is shown in drawing 5 (b), it is formed in four corners around a viewing area (namely, field in which the OLED film 30 is formed) on the glass substrate 10, but if it is fields other than a luminescence field, you may prepare in any location and a configuration (or area) can also adopt the configuration of arbitration further. For example, as shown in drawing 2 , you may prepare in the perimeter of a luminescence field. This indicator 50 consists of organic materials, such as inorganic materials, such as calcium, or anthocyanin system coloring matter, as mentioned above. In addition, it is necessary to make it moisture not stick to an indicator 50 into a production process in the gestalt of this operation. Also in the gestalt of this operation, after panel-izing, the amount of the moisture which invaded in the closure space 26 can be detected, and it becomes possible to acquire the same operation and effectiveness as the gestalt 1 of the above-mentioned operation.

[0020] Drawing 6 is drawing showing the outline configuration of the modification of the OLED display of the gestalt 4 of operation of this invention, and this drawing (a) is a top view showing arrangement of each part which shows an important section sectional view and this drawing (b) in this drawing (a). Hereafter, a difference with the OLED display shown in drawing 5 is explained about the OLED display shown in drawing 6 . The light which emitted light by the luminous layer 13 of the OLED film 30 carries out difference of the OLED display shown in drawing 6 to the OLED display shown in drawing 5 at the point emitted to a protective coat 60 side, as an arrow head shows to drawing 6 . Therefore, as for a protective coat 60, with the gestalt of this operation, it is desirable that it is transparent. Moreover, cathode 15 is formed in the glass substrate 10 side of the OLED film 30, and an anode plate 11 is formed in the protective coat 60 side of the OLED film 30. In addition, as an indicator 50 is shown in drawing 6 (b), it is formed in four corners around a viewing area (namely, field in which the OLED film 30 is formed) on the glass substrate 10, but if it is fields other than a luminescence field, you may prepare in any location and a configuration (or area) can also adopt the configuration of arbitration further. For example, as shown in drawing 2 R> 2, you may prepare in the perimeter of a luminescence field.

[0021] Also in the gestalt of this operation, after panel-izing, the amount of the moisture which invaded in the closure space 26 can be detected, and it becomes possible to acquire the same operation and effectiveness as the gestalt 1 of the above-mentioned operation. Moreover, although the above-mentioned explanation explained the gestalt of the operation which applied this invention to the OLED display of a passive matrix, it cannot be overemphasized that this invention is not limited to this and it can apply to the OLED display of an active matrix. As mentioned above, although invention made by this invention person was concretely explained based on the gestalt of said operation, as for this invention, it is needless to say for it to be able to change variously in the range which is not limited to the gestalt of said operation and does not deviate from the summary.

[0022]

[Effect of the Invention] It will be as follows if the effectiveness acquired by the typical thing among invention indicated in this application is explained briefly. According to the display using the electroluminescent element of this invention, after panel-izing, it becomes possible to detect the amount of the moisture which invaded in closure space.

[Translation done.]